ISSN (print) 0093-4666 © 2012. Mycotaxon, Ltd. ISSN (online) 2154-8889

MYCOTAXON

http://dx.doi.org/10.5248/119.445

Volume 119, pp. 445–451 *January–March 2012*

Four new records of lecideoid lichens from China

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Abstract — Four lecideoid lichen species, *Carbonea vorticosa*, *Lecidea diducens*, *L. promiscens,* and *Lecidella bullata,* are reported for the first time from China.

Key words —Yunnan, Xizang, *Lecanoromycetes*, taxonomy

Introduction

As once one of the largest lichen genera, *Lecidea* s. lat. has had an extraordinarily broad circumscription, with Zahlbruckner (1926) accepting more than 1350 species. Subsequently, *Carbonea, Lecidella,* and many other obviously more natural units have been excluded based on the ascomal structure, especially the nature of the hamathecial tissues, ascus apical structures, and exciple (Hertel 1977, 1995; Smith et al. 2009). *Lecidea* s. str. has now become a medium-sized genus that lacks algae in the exciple and has a *Lecidea*-type ascus (Hertel 1995, Pérez-Ortega & Etayo 2008). *Carbonea* is characterized by a "carbonized" exciple and *Lecanora*-type ascus (Hertel 1983, Nash et al. 2004). *Lecidella* is characterized by *Lecanora*-type ascus and discrete paraphyses (Nash et al. 2004).

Worldwide, *Carbonea* includes 20 known species, *Lecidea* s. str. about 100 species, and *Lecidella* 79 species (Kirk et al. 2008). In China, these lecideoid lichens are still poorly known with only two *Carbonea,* 10 *Lecidella,* and 14 *Lecidea* s. str. species previously reported (Wei 1991; Abass & Wu 1998; Aptroot 2002, 2003; Obermayer 2004; Guo 2005; Zhang et al. 2010). During our study of lecideoid lichens from China, four species new to the country —*Carbonea vorticosa, Lecidea diducens, L. promiscens,* and *Lecidella bullata*— have been identified.

Materials & methods

The specimens studied were collected from Western China, and are preserved in SDNU (Lichen Section of Botanical Herbarium, Shandong Normal University), HKAS (Herbarium of Cryptogams, Kunming Institute of Botany Academia Sinica), or HMAS-L (Lichen Section, Herbarium of Mycology, Institute of Microbiology, Academia Sinica). Specimen morphology and anatomy were examined using a stereo microscope (COIC XTL7045B2) and a polarizing microscope (Olympus CX41). Lichen substances were identified using standardized thin layer chromatography techniques (TLC) with C and J system (Orange et al. 2010). Photos of the thalli were taken using a Olympus SZX12 with DP72.

The new records

Carbonea vorticosa (Flörke) Hertel, Mitt. Bot. Staatssamml. München 19: 442 (1983) Fig. 1A

Thallus crustose, indistinct, endolithic to areolate, thin; prothallus absent to not obvious; surface grey or white, rough. Apothecia sessile, up to 1.0 mm in diam.; disc black, plane to a little convex, epruinose; margin black, flexuous in older apothecia, long persistent; exciple blackish green to dark brown, hyphae radiating, 3.5–5 μm; epihymenium bluish green; hymenium hyaline with some green, 35–60 μm; hypothecium black to brown; asci clavate, 8-spored; ascospores hyaline, simple, oblong-ellipsoid, 10–13.5 × 3–5 μm.

Spot tests — K–, C–, KC–, P–.

Secondary metabolites — none detected.

Specimens examined — **China**. **Yunnan:** Deqin county, Mt. Baimaxueshan, alt.4800 m, on rock, 13 Jul. 1981, L.S. Wang 12786 (HKAS); Lijiang city, Mt. Laojun, alt. 4000m, on rock, 7 Nov. 2009, Y.L. Cheng 20100337-1, 20100289 (SDNU).

Comments — *Carbonea vorticosa* is closely related to *C. capsulata*, which also produces small apothecia, a blue epithecium, and a brown hypothecium. However, *C. capsulata* has a more conspicuously blue hymenium and broader (5–10 μm diam.) excipular hyphae.

Reported from Antarctica, Asia, Australasia, Europe, and North and South America (Hertel 1991, Galloway 2007, Nash et al. 2004, Smith et al. 2009), *C. vorticosa* is new to China.

Lecidea diducens Nyl., Flora 48: 148 (1865) Fig. 1B

Thallus lacking or very indistinct, grey, not continuous; prothallus indistinct; medulla I+ deeply violet. Apothecia black, sessile, constricted at the base, up to 1.4 mm in diam.; disc black, flat to slightly convex, dull to shiny, epruinose; margin well developed, persistent; exciple with a blackish to dark brown rim and paler to hyaline interior, C+ red, K–; epihymenium blackish green; hymenium 45–50 μm, very pale green to hyaline; paraphyses simple, occasionally branched and anastomosing; subhymenium somewhat more intensely green than the

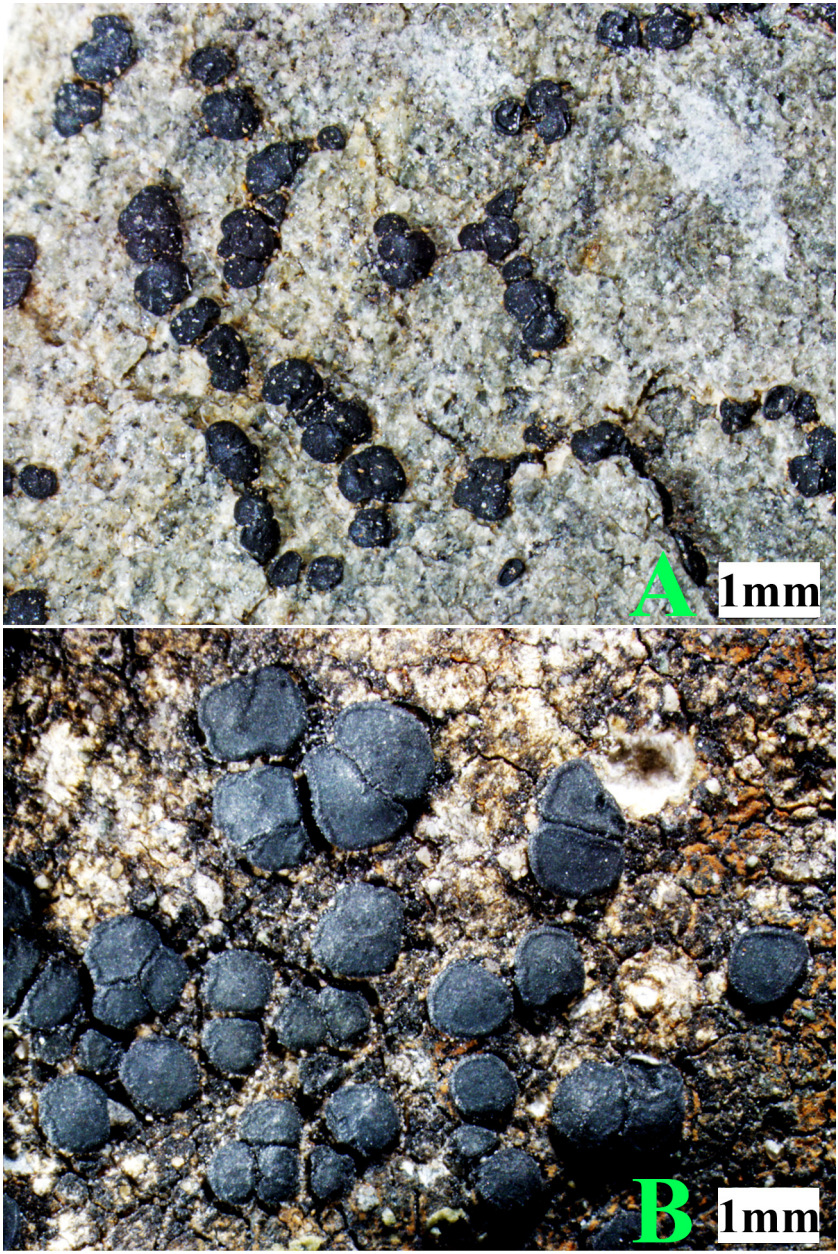

Fig. 1 A. *Carbonea vorticosa* (L.S. Wang 12786, HKAS);
B. *Lecidea diducens* (H.Y. Wang 20100297, SDNU).

hymenium, 10–30 μm thick; hypothecium pale brown to brown; asci clavate, 8-spored; ascospores simple, oblong-ellipsoid, 7.5–11 × 3.5–4 μm.

Spot tests — K–, C–, KC–, P–.

Secondary metabolites — 2'-*O*-methylanziaic acid.

Specimens examined — **CHINA**. **Yunnan:** Lijiang county, Mt. Laojun, alt. 4000 m, on rock, 7 Nov. 2009, H.Y. Wang 20100332, 20100297 (SDNU).

Comments — *Lecidea diducens* is morphologically similar to *L. auriculata,* which lacks confluentic acid in the exciple and so is C–.

Probably cosmopolitan, *L. diducens* has been reported from Europe, North and South America, Asia, and Australasia (Hertel 1991, 2006, Hertel & Andreev 2003, Nash et al. 2004, Smith et al. 2009). New to China.

Lecidea promiscens Nyl., Flora 55: 358 (1872) Fig. 2A

Thallus grey, thin, not continuous; prothallus indistinct; medulla white, I+ deeply violet. Apothecia black, sessile, 0.8–1.8 mm in diam., disc black, flat to slightly convex, epruinose; margin black, well developed, persistent, often undulate; exciple with a thin blackish rim and hyaline to light brown interior; epihymenium greenish black to black; hymenium hyaline to pale green, 50–62 μm tall, I+ blue; paraphyses simple, occasionally branched, anastomosing; subhymenium hyaline to light brown; hypothecium brown to dark brown; asci clavate, 8-spored; ascospores hyaline, simple, oblong to oblong-ellipsoid, 7.5–12 × 4–4.5 μm.

Spot tests — K–, C–, KC–, P–.

Secondary metabolites — confluentic acid.

Specimen examined — **CHINA**. **Yunnan:** Deqin county, Meilishi village, Suola Yakou, alt. 4700 m, on rock, 30 Aug. 2009, L.S. Wang 00-19783 (HKAS).

Comments — *Lecidea promiscens* is very similar to *L. auriculata* but has broader and larger spores. It also has a less prominent exciple (in *L. auriculata* the exciple extends quite far under the hypothecium), and a darker hypothecium.

Reported from Europe, North and South America, Asia, and Australasia (Thomson 1997, Hertel 1991, 2006, Nash et al. 2004), *L. promiscens* is new to China.

Lecidella bullata Körb., Parerga Lichenol.: 200 (1861) Fig. 2B

Thallus crustose, aerolate or bullate, moderately thick, grey-white to yellow-white, without soredia or isidia; prothallus absent. Apothecia sessile to semi-immersed, up to 1.5 mm in diam., disc black, flat to slightly convex, greyish pruinose to epruinose; margin black, at first prominent, later excluded; exciple greenish black outside and hyaline interior; epihymenium blue-green to black-green; hymenium hyaline, 40–55 μm tall, I+ blue; paraphyses simple; subhymenium and hypothecium hyaline, with crystals; asci *Lecanora*-type,

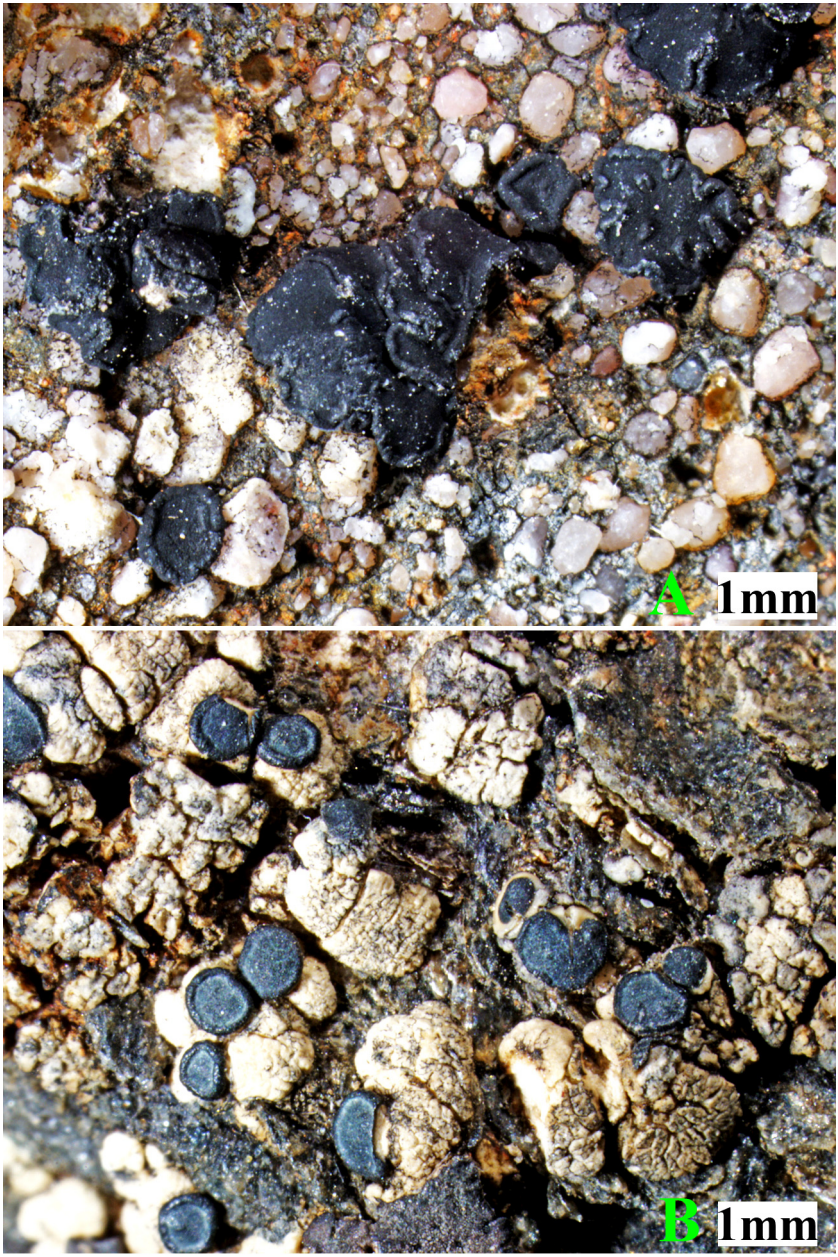

Fig. 2 A. *Lecidea promiscens* (L.S. Wang 00-19783, HKAS);
B. *Lecidella bullata* (J.C. Wei X024916, HMAS-L).

clavate, 8-spored; ascospores hyaline, simple, ellipsoid to broad-ellipsoid, 7–12 × 5–6 μm.

Spot tests — K+ yellow, C–, KC+ yellow, P+ yellow.

Secondary metabolites — atranorin, xanthones, ± psoromic acid, ± zeorin.

Specimens examined — **China**. **Yunnan:** Deqin county, Mt. Baimaxueshan, alt. 4500 m, on rock, 25 May 1985, L.S. Wang 8909(HKAS); **Xizang:** Mt. Qomolangma, Zhongrongbu, alt. 5550 m, on rock, 28 May 1966, J.C. Wei X024916 (HMAS-L).

Comments — *Lecidella bullata* is very similar to *L. stigmatea*, which also has a colorless internal excipulum and subhymenium. However, *L. stigmatea* has a very thin, rimulose or scattered verrucose thallus and no psoromic acid.

Reported from the Arctic, Europe, Asia, and North America (Inoue 1997, Thomson 1997), *L. bullata* is new to China.

Acknowledgements

The project was financially supported by the National Natural Science Foundation of China (31170187, 31070010, 31000008). The authors would like to thank the keeper of the HMAS-L, Ms Deng Hong for assistance during this study. The authors thank Dr. A. Aptroot (ABL Herbarium, Soest, The Netherlands) and Prof. Shou-Yu Guo (Key Laboratory of Systematic Mycology & Lichenology, Institute of Microbiology, Chinese Academy of Sciences, Beijing, China) for presubmission reviews.

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